

pA@RHIC follow up discussions

April 18th, 2013@BNL

Xiaodong Jiang

- pA@RHIC workshop summary document.
- pA observable, predictions and projections.
- My own questions to theorists on $dN_{ch}/d\eta$.

Again: sorry for the short notice.

We will have another pA@RHIC discussion session in June during the User's meeting.

Workshop Summary Document

(a brief outline)

- Introduction, pA@RHIC motivation, uniqueness and complementarity to pA@LHC.
- Main physics topics for pA@RHIC. Observables and theory predictions.
 - Charge multiplicities.
 - Spin independent observables. Particle correlations.
 - Spin dependent observables. SSA.
- Machine capability and machine technical issues.
 - Near term (run-2013-2016) and longer term capability (beyond 2017)
 - pA collisions on different species, projected luminosities.
 - technical issues, and planned tests.
- Experiments and p+A measurement projections:
 - STAR.
 - PHENIX. (Multiplicity. Prompt photon. Forward π^0 SSA in pA vs p+p).
 - pp2pp setup.
 - very forward photon and π^0 . Inputs to high energy cosmic ray shower.
- Conclusions.

Jianwei's summary at the workshop

Conclusions on physics opportunities of pA:

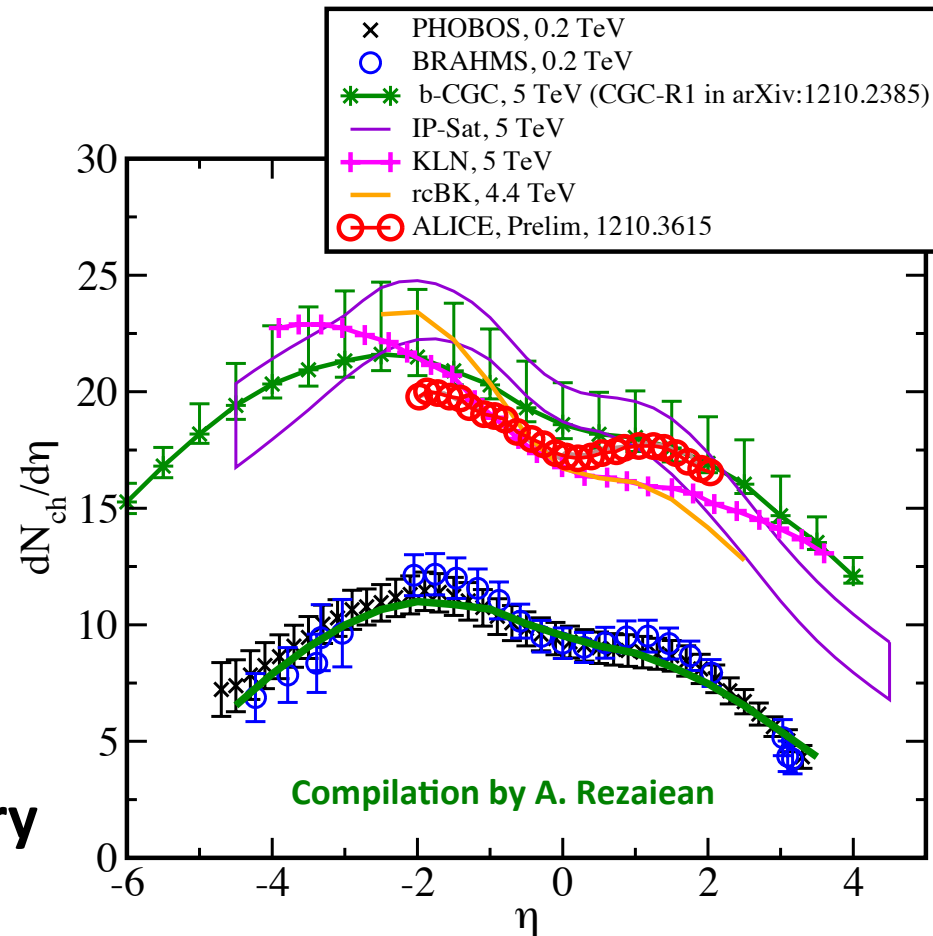
- ➡ Will produce a novel information on strong interactions in the high gluon density kinematics for fixed nuclear thickness as a function of energy:
parton, groups of partons propagation through media in soft and hard regime including spin effects
- ➡ Will complement pA run at LHC - critical for understanding how small x dynamics changes with energy
- ➡ Will allow to measure inelastic diffraction at the highest energy where it is still comparable/larger than e.m. contribution
- ➡ Check the color fluctuation dynamics for generic inelastic pA collisions

Xiaodong Jiang's questions on multiplicity for pA@RHIC

In saturation models

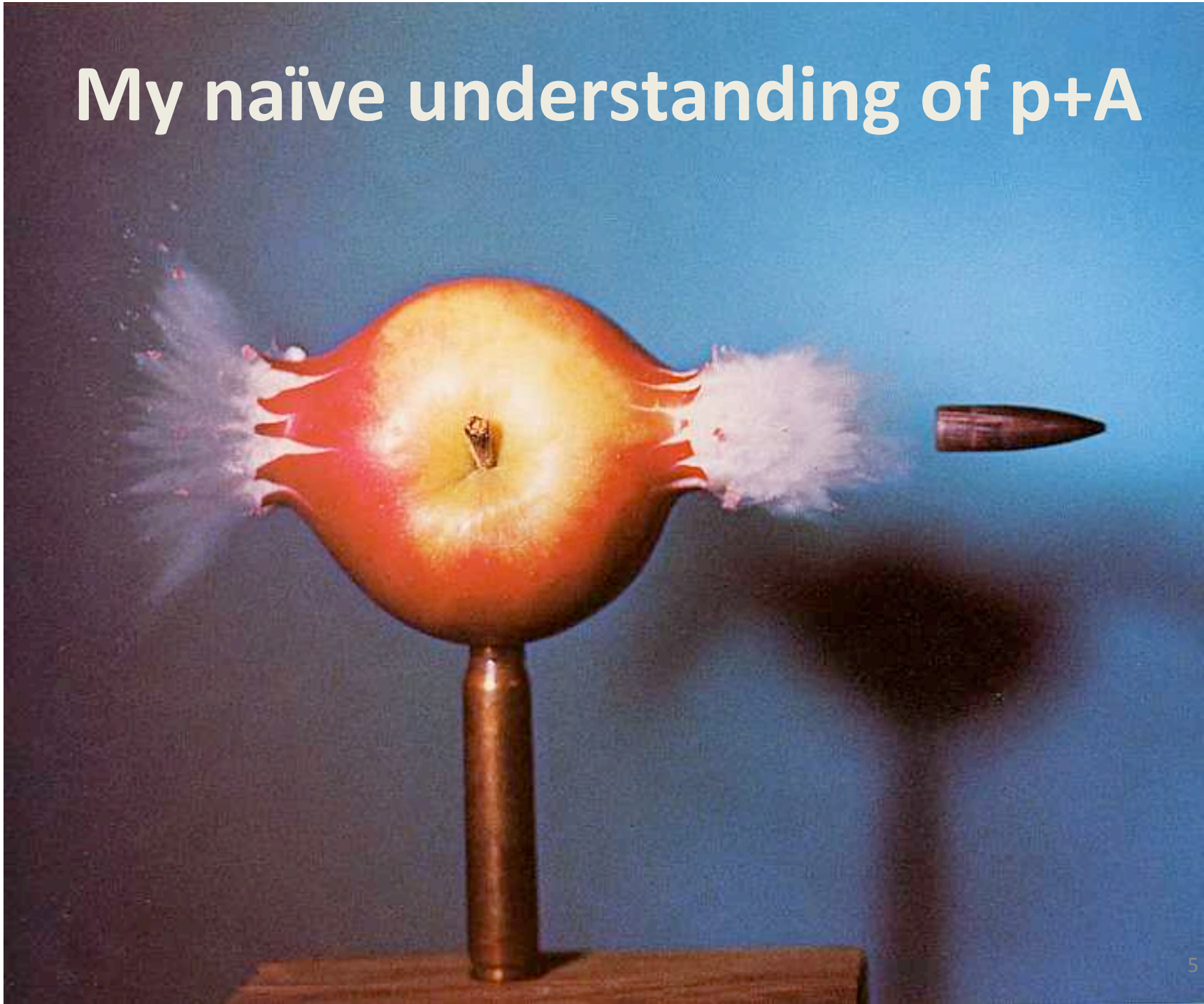
$$\frac{dN}{d\eta} \propto \frac{Q_S^2 S_{\perp}}{\alpha_S(Q_S)}$$

Multiplicities have some sensitivity to “infrared” non-pert. physics/geometry

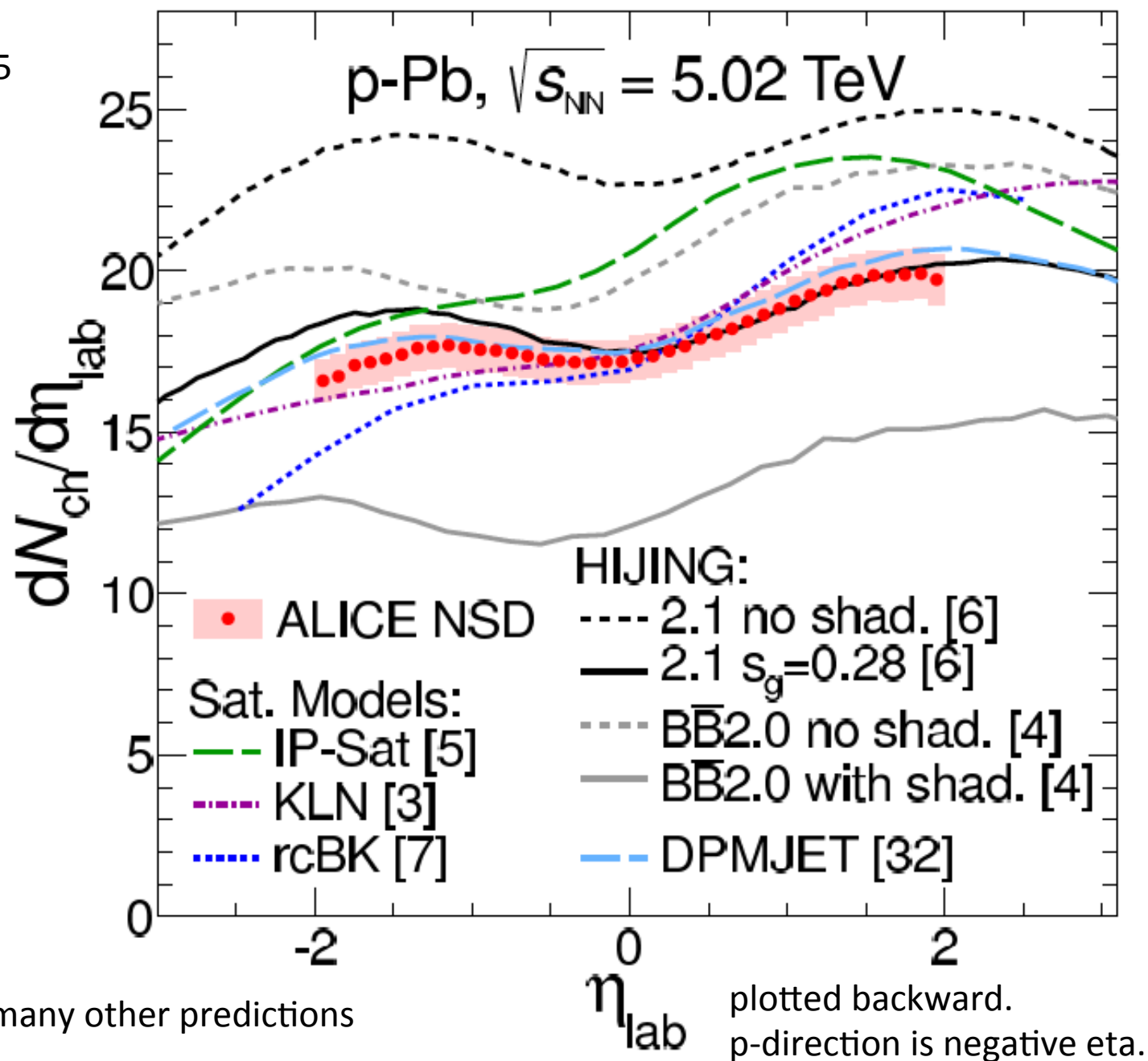


From Raju's talk at the workshop.

My naïve understanding of p+A



1210.3615

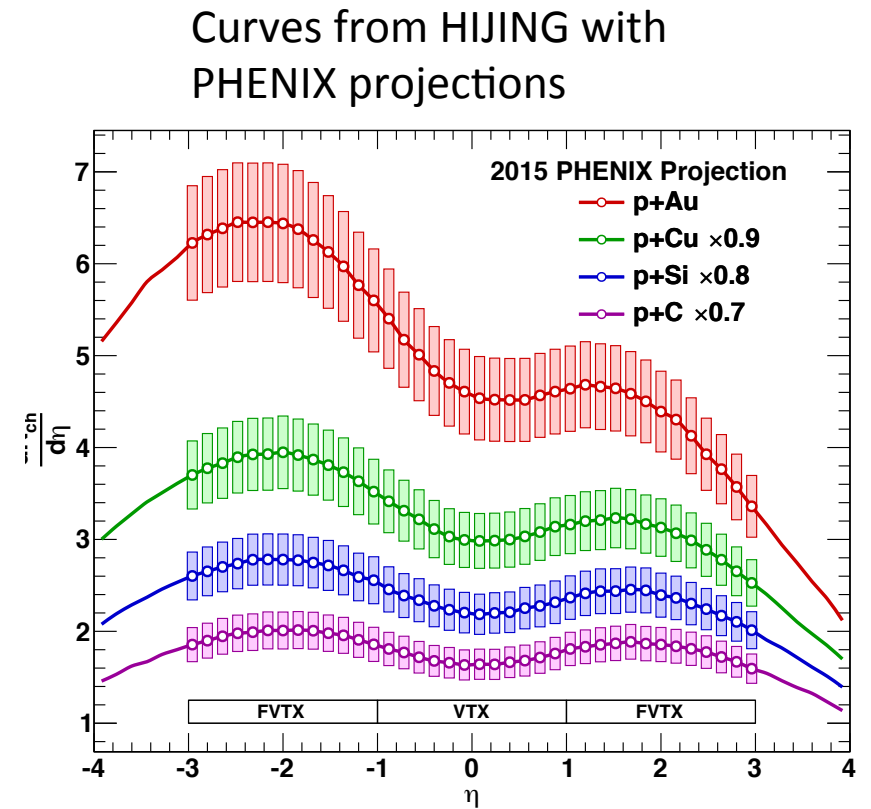
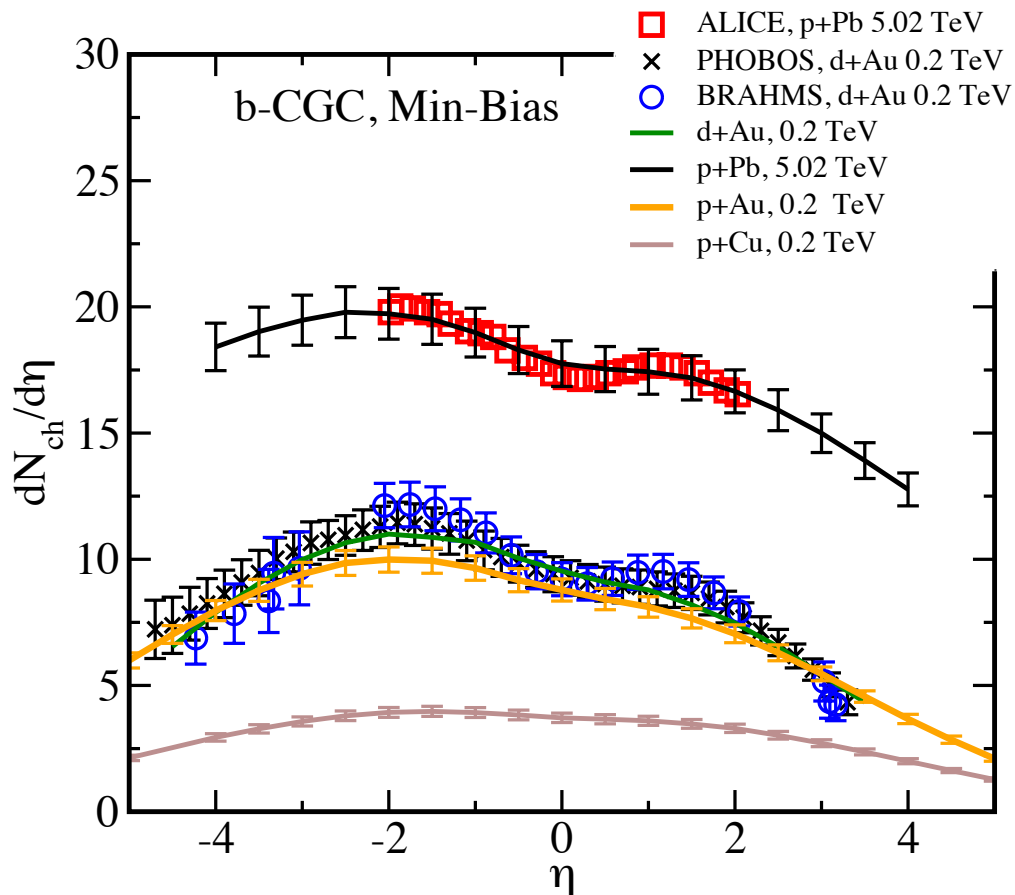


There're many other predictions

Fig. 1: Pseudorapidity density of charged particles measured in NSD p-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV compared to theoretical predictions [3–7]. The calculations [4, 5] have been shifted to the laboratory system.

Q: the impacts of new RHIC data p+Au, p+Cu (or p+Si) to CGC-type theory models ?
other model predictions ?

A. Rezaeian, private communications.(April, 2013).



Need more theory guidance in details on the impacts of polarized observables for pA@RHIC.

Jianwei's summary at the workshop

□ Polarized pA at RHIC provides a completely new testing ground for QCD

Dynamics cannot be accessed by unpolarized x-section

QCD is much richer than the leading power!

□ SSA in pA is an excellent observable to study small-x physics in a nucleus

Rich Seto will raise more questions on this topic later.